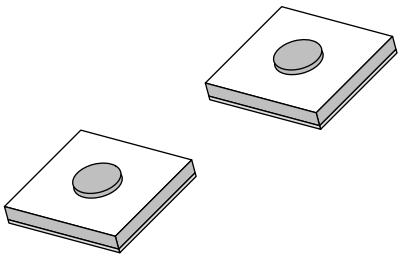
DATA SHEET

SMV2019 to SMV2023: Silicon Hyperabrupt Varactor Diode Chips

Features

- High Q for low loss resonators
- Low leakage current
- High tuning ratio for wideband VCOs
- SPICE model parameters
- Small footprint chip design
- Available lead (Pb)-free, RoHS-compliant, and Green



Description

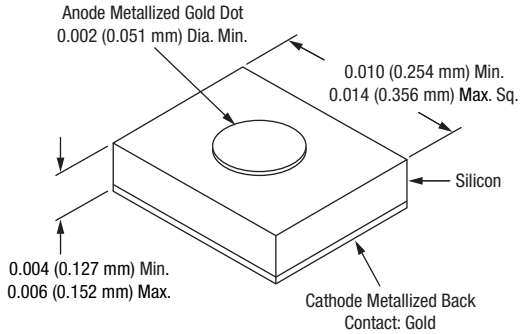
Skyworks silicon hyperabrupt junction varactor diode chips are processed using established ion-implantation technology resulting in low R_S wide tuning ratio devices with high Q values. These planar chips have a small outline size (12 x 12 mils nominal) and are fully passivated, resulting in low leakage current and high reliability. These varactor chips are intended for assembly in hybrid integrated circuit resonators used in VCOs and analog tuned filters.

NEW

Skyworks Green products are lead (Pb)-free, RoHS (Restriction of Hazardous Substances)-compliant, conform to the EIA/EICTA/JEITA Joint Industry Guide (JIG) Level A guidelines, and are free from antimony trioxide and brominated flame retardants.

Outline Drawing

149-801



Absolute Maximum Ratings

Characteristic	Value
Reverse Voltage (V_R)	22 V
Forward Current (I_F)	100 mA
Power Dissipation at 25°C (P_D)	250 mW
Operating Temperature (T_{OP})	-55 °C to +150 °C
Storage Temperature (T_{ST})	-65 °C to +200 °C

Performance is guaranteed only under the conditions listed in the specifications table and is not guaranteed under the full range(s) described by the Absolute Maximum specifications. Exceeding any of the absolute maximum/minimum specifications may result in permanent damage to the device and will void the warranty.

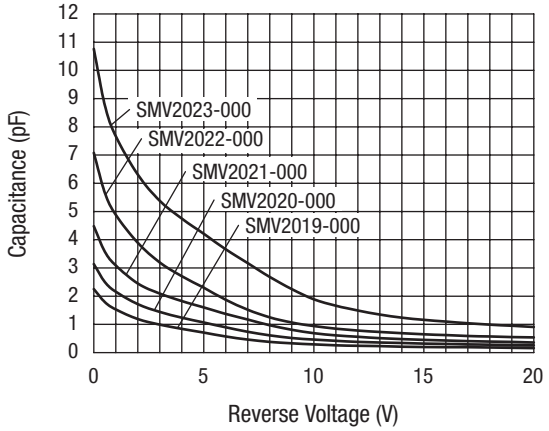
CAUTION: *Although this device is designed to be as robust as possible, ESD (Electrostatic Discharge) can damage this device. This device must be protected at all times from ESD. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD precautions must be employed at all times.*

Electrical Specifications at 25 °C

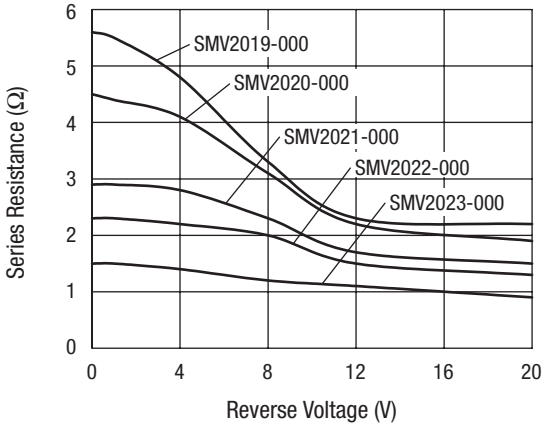
Part Number	C_J @ 0 V (pF)[1]	C_J @ 4 V (pF)		C_J @ 20 V (pF)		Q @ 4 V 50 MHz[2]	1 GHz R_S @ 4 V (Ω)	I_R @17.6 V (nA)[3]	Contact Diam. (mils)[4]
	Typ.	Min.	Max.	Min.	Max.	Min.	Typ.	Max.	Nom.
SMV2019-000	2.3	0.68	0.88	0.13	0.23	500	4.8	50	2
SMV2020-000	3.1	1.13	1.43	0.23	0.33	500	4.1	50	2.5
SMV2021-000	4.5	1.58	1.98	0.32	0.44	500	2.8	50	3
SMV2022-000	7.1	2.48	3.08	0.48	0.68	400	2.2	50	3.75
SMV2023-000	10.8	4.28	5.28	0.78	1.08	400	1.4	50	5

1. All capacitance values specified at 1 MHz.
2. 50 MHz Q calculated from 1 GHz R_S and 1 MHz C_J.
3. V_B at 10 µA specified at 22 V Min.
4. Outline drawing 149-801.

Typical Performance Data



Capacitance vs. Reverse Voltage

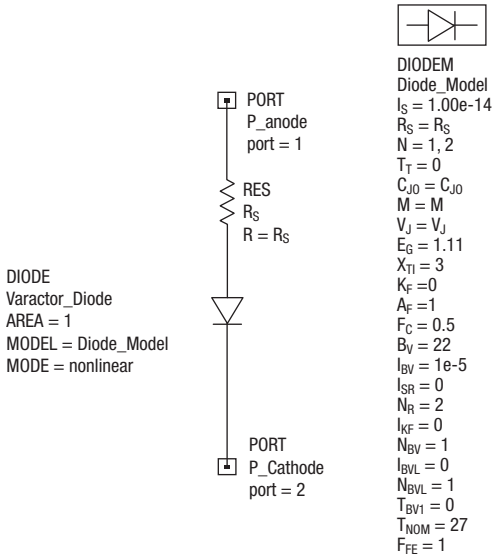


Series Resistance vs. Voltage @ 1 GHz

Typical Capacitance Values

V_R (V)	SMV2019 C_J (pF)	SMV2020 C_J (pF)	SMV2021 C_J (pF)	SMV2022 C_J (pF)	SMV2023 C_J (pF)
0	2.25	3.14	4.48	7.08	10.76
0.5	1.79	2.5	3.57	5.66	8.76
1	1.53	2.16	3.09	4.88	7.67
2	1.19	1.72	2.45	3.89	6.31
3	0.99	1.44	2.09	3.19	5.38
4	0.84	1.24	1.83	2.71	4.75
5	0.71	1.07	1.6	2.3	4.21
6	0.57	0.9	1.37	1.87	3.66
7	0.46	0.74	1.17	1.52	3.17
8	0.38	0.61	0.97	1.25	2.68
9	0.33	0.52	0.81	1.07	2.25
10	0.29	0.46	0.69	0.94	1.89
11	0.26	0.42	0.61	0.85	1.66
12	0.24	0.38	0.56	0.78	1.49
13	0.23	0.36	0.51	0.73	1.35
14	0.21	0.34	0.48	0.69	1.24
15	0.2	0.32	0.45	0.65	1.16
16	0.19	0.31	0.43	0.62	1.1
17	0.19	0.29	0.41	0.59	1.04
18	0.18	0.28	0.39	0.57	0.99
19	0.17	0.27	0.38	0.55	0.95
20	0.16	0.26	0.36	0.54	0.91

SPICE Model



$$C_V = \frac{C_{J0}}{\left(1 + \frac{V_R}{V_J}\right)^M}$$

Part Number	C_{J0} (pF)	V_J (V)	M	R_S (Ω)
SMV2019	2.3	3.5	1.4	4.8
SMV2020	3.3	3.6	1.3	4.1
SMV2021	4.5	3.9	1.34	2.8
SMV2022	7.1	4	1.4	2.2
SMV2023	10.8	4.6	1.45	1.4

SPICE model parameters extracted from measured characteristics may not reflect exact physical or electronic properties. See application note APN1004.